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FIRE CONTROL SYSTEM FOR COASTAL ARTILLERY

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**Foreign Technology Division
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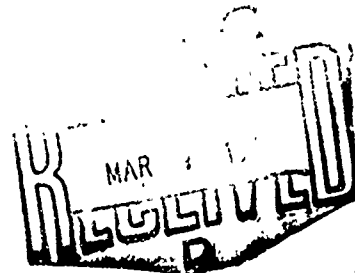
FOREIGN TECHNOLOGY DIVISION



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by

M. Memedovic



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13. ABSTRACT

By introducing the coastal artillery fire control system (SUVOA), a qualitative leap was made in precision and speed of fire on targets on the sea, at all distances in all conditions. The system contains modern electronic equipment which synchronizes activity of all the elements of the system as well as controls and directs all artillery weapons. Important characteristics of the SUVOA system are: fast and exact artillery fire control data; fire control by means of the distance measuring instrument OD-M64 or by means of the radar 3MK7; fire correction in one or two fusillades; automatic monitoring of the target provides immediate correction of firing information regardless of the maneuver of the target; provides better protection of radar equipment by placing it out of the fire line (up to 600 meters); reduces the number of computing devices serving the system; can be used without radar equipment in all conditions when the distance measuring devices sees the target; reduces preparation time for fire; provides a possibility of locating weapons and auxiliary equipment of widely varying altitudes. Important drawbacks of the SUVOA system are: complex electronic equipment requires high level of operator skill, at the same time, maintenance is difficult; the equipment and cables are susceptible to enemy fire and bombs; and it requires a great deal of time for repairs. AP2017636

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| | Fire Control Equipment Fire Control Radar Fire Control Computer/(U)ODM64 Distance Measuring Device (U)3MK7 Radar (U)SUVOA Fire Control System | | | | | | |

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FIRE CONTROL SYSTEM FOR COASTAL ARTILLERY

Major Mihailo Memedovic

In the event of an enemy landing on beaches and islands, there will be many targets in the form of large and small warships and landing vessels of all types. Because of this, there is a need for massive, fast and precise firing of coastal artillery batteries with rapid changes from broad to concentrated and from direct to indirect firing. A good part of these operations will be performed during the night and at dawn during periods of low visibility which requires equipment that will insure fast and accurate firing, fast neutralization or destruction of targets with a low consumption of ammunition. Especially after introduction of radar equipment, coastal artillery batteries have performed satisfactorily but relatively slowly and with excessive use of ammunition. Incorporation of the Fire Control System for Coastal Artillery (SUVOA) is an important step in fast, precise firing on most modern targets at sea, for long to short ranges, under all conditions.

Characteristics of "SUVOA" and its advantages over other methods

This system is composed of very complicated electronic

equipment which connects and synchronizes all elements in the system, gives starting elements for firing, provides for continuous tracking of the target and controls all elements during firing. The characteristics of this system are: insures establishing fast and accurate first elements for firing, with incorporation of necessary corrections; insures the possibility for observing salvos with the range-finder from the vertically mobile base OD-M64 or with the aid of radar 3MK7; makes corrections often for one or two squad or battery salvos. It follows the target automatically, gives corrected current information regardless of target maneuvers in direction or distance. It insures pullout of the radar outside of the battery firing line (up to 600 meters) which is important for movable coastal batteries. It decreases the number of calculators serving the system. It can be used without radar under all conditions when the range-finder can see the target. It decreases the time needed for preparation for firing with movable batteries and establishes constant readiness for firing with batteries in fixed positions. It enables the battery to be placed at any elevation. The very complicated electronic technique of the system makes heavy demands on commanders and personnel and is difficult to maintain. Cables and installations are very sensitive to grenade fragments, aircraft bombs and rockets; and, it takes too much time to correct damage from enemy firing. It requires additional supply sources, etc.

Obvious advantages of this system over the present one are evident particularly during night firing, under low visibility conditions and during the daytime over short and long distances. Radar can reveal battery positions at night, and makes it possible for the battery to do a more reliable job. In the meantime

it must be kept in mind that some of the sensitive parts of the SUVOA system will be damaged during firing. This means that the present methods and equipment for firing must be retained, and we must continue the study to make further improvements. For this reason, battery instruments and their applications must not be neglected. Range finders for horizontal base, short and simple preparations, firing with the aid of radar without the system, and synchronized transmission should be emphasized, because some people believe that the calculators and firing personnel of the coastal batteries should not be trained in firing with the present equipment, and also that the use of SUVOA can make the battery in question completely ready for operation.

The Possibilities which SUVOA offers in firing accuracy

The system is constructed so that it can fire with or without radar. The radar system is used during the night and during periods of low visibility when the firing commander cannot see the salvo and follow the target with the range finder (Fig. 1).

During this type of firing, radar follows the target and establishes the direction, distance and azimuth of the target. At the same time, this information is transferred from the radar to the parallax device which makes corrections taking into consideration the coordinate difference in direction and distance of the radar in relation to the center of the battery. The parallax device calculates the elements of the azimuth the distance for the gunner, and sends this to a range finder where corrections of distance (overtaking, overshooting, passing, etc.) are incorporated. The information in signal form is transmitted over cables to a battery distribution box and then to the direction and distance receivers of every weapon. The

firing corrections received from the radar are used to make adjustments in previous information by calculators on the range-finder and are then transferred to the weapon receivers. But when the firing commander can, with the aid of the range-finder on the vertically mobile base OD-M64, watch and follow the target and observe the salvos, the radar and parallax devices are disconnected from the system. In this case he receives, with the aid of the calculators and range-finder, the original information and subsequent corrections of the range-finder, combines all information units, then sends the result in signal form through cables and the battery distribution box to the direction and distance receivers of the weapons which control the firing of the first salvo (Fig. 2).

It is important to note that these two methods of using the system have great advantages, because they can function either together or separately in case one of them is disabled temporarily or for a longer period of time. Also, it should be emphasized that work can be done much faster with the further use and development of SUVOA, and a more accurate firing achieved by creating a variety of tables and graphs for a quick reading of necessary corrections.

The Role of the firing commander during use of this system

In the permanent coastal batteries during firing using SUVOA, the commander should be on the observing tower with the range-finder which he uses to help him handle the firing of his platoon. He personally gives the orders which are transmitted as signals from the range-finder to the commanding box and on to the weapons. He also personally observes and follows, with the aid of the range-finder and measuring-calculators, the results of

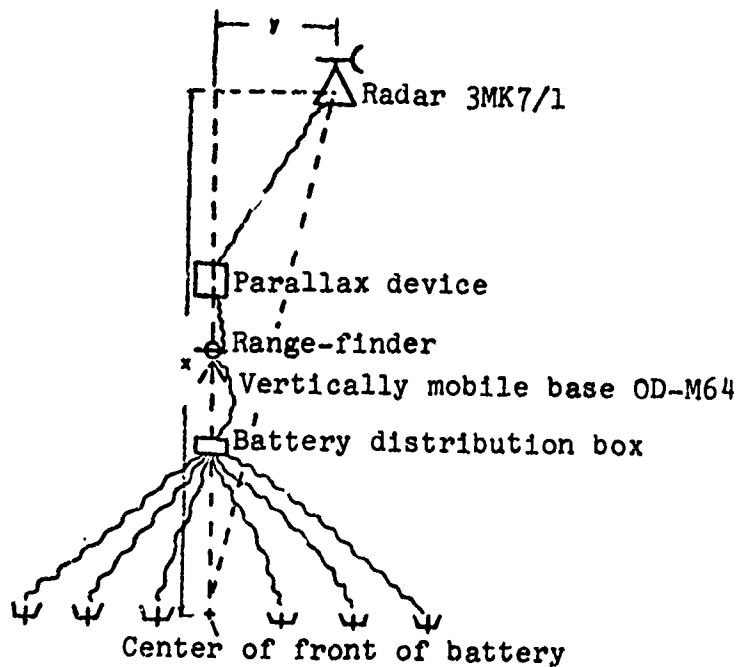


Figure 1. Principle of operation of SUVOA with the use of radar.

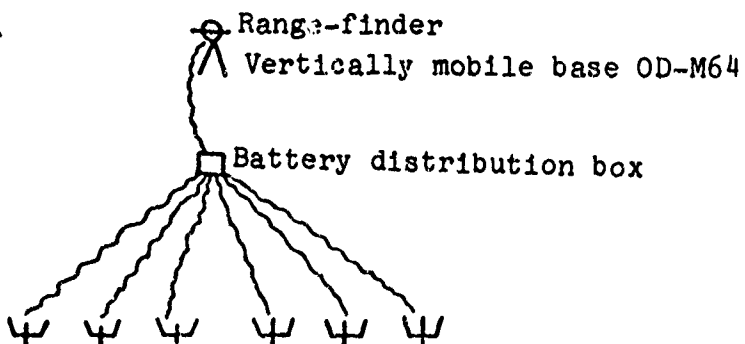


Figure 2. Principle of operation of SUVOA without the use of radar.

firing on the target. He is also in constant telephone contact with the radar and weapon commanders. His place is at the observing tower, because in case the system is temporarily disabled or damaged he can quickly switch to firing using one of the previous methods until the system is repaired. If the batteries are mobile and if the firing is done with the range-finder, he can be at the range-finder which is located at the firing position. He can also be at the observing position and watch the targets. If the range-finder is used only as a calculator, establishing contact between the radar and the weapons, he can be at the observing position watching the targets where he has contact with all the elements of the platoon and can supervise them. In this case, the commander of the "ROD" (radar personnel) is responsible for the work done using the range-finder.

Installation of the system with permanently positioned and movable coastal artillery batteries

Permanently positioned coastal artillery batteries, despite their inability to maneuver, remain an important element in the firing power of coastal artillery, especially in defense of islands and coastlines with many bays and inlets, as is the case with our coast. For this reason the best solution must be found for the installation of SUVOA in those batteries. There is a way to install all the elements underground or in a suitable place, so that they cannot be neutralized by the firing of classical weapons without direct hits. This is especially true for batteries installed in bunkers with limited firing zones. Radar at these batteries can be installed near the firing position of the main concentration of weapons. If that is not possible, then the radar can be moved from the firing position, but not so far as to impair its ability to transmit parallax information to the

firing position. In any case the radar and its power supply is covered by a strong roof. The only part that is left exposed is the antenna which is necessary to accurately scan the designated area. Cables should be buried from the radar and the sources of supply to the other elements, at the established depth with a sufficient number of entry points for connecting sections and ease of repair in case of damage. If the radar is in the firing area, cables are routed underground to the transformer, parallax device and range-finder. The range-finder is installed at the observation point and near the batteries in the bunkers. For batteries with an open firing range or a 360° range, the range-finder should be installed at the observation point so it is movable. There will be cases, especially on the small islands, when the firing range is 360° over water. The work of the range-finder is then improved in the entire zone. Because of the range-finder's position, the parallax device, transformer, battery distribution box and all the cables which connect them with other elements of SUVOA and with the weapons are installed underground. This type of system installation is possible in most permanent coastal artillery batteries. It insures the protection of SUVOA elements making them less sensitive to damage when the battery is being fired upon, and for this reason it has a longer life and service.

In mobile coastal artillery batteries, the elements SUVOA are installed more often with separate radar and power supply sources outside of the firing zone of the main weapon concentration. This makes it easier to camouflage the batteries, for there are fewer elements on the firing range. This installation produces better conditions for observing and following the targets, decreases the chances of

being discovered and having the radar, sources of supply and other elements fired upon by the enemy on the firing range. This type of SUVOA arrangement requires that more security measures be taken, especially to protect it from the various groups whose targets for attack will be coastal artillery batteries. The remaining elements are positioned in the firing range. The position of each element is selected and protected. Cables which connect the radar with the firing position and the cables in the firing position itself are buried and camouflaged for safety. During this process the range-finder on a vertically mobile base should be placed where it can observe and follow the events. If this is impossible, then the range-finder serves only to transfer information from the parallax device to the weapons. It is very often installed in the center of the front line, behind the weapons. During the preparation of the firing positions in peace time, all elements SUVOA can be prepared in advance, strengthened and camouflaged.

This article has touched on some of the questions which have arisen during the use of the system SUVOA in coastal batteries. The goal is to achieve in its further development more knowledge and experience to better utilize the system in firing at targets on the sea. Technical use, maintenance, installation, correcting information, and group firing should be the subject of further observations.